

光电系统与工程

一种高星等标准星光模拟器的设计与性能分析

冯广军^{1,2}; 马臻^{1,2}; 李英才¹

1.中国科学院西安光学精密机械研究所, 陕西西安710119;
2.中国科学院研究生院, 北京100039

摘要:

在卫星探测相机及星敏感器的地面标定实验中, 需要一台能够模拟无穷远处极小星点以及极弱星光照度的光源, 即星光模拟器。采用积分球均匀点光源加准直平行光管模拟出无穷远处的星点, 使用可变光阑调节光能量动态范围, 提高模拟星等。同时点光源的光亮度可以精确测定, 再通过精确测量影响星等照度的各个因素, 从而解决弱光情况下的标定问题。分析模拟器的模拟星等能力及精度, 在现有加工测试条件下, 星光模拟器能够满足模拟6~14星等照度要求且精度较高, 完全满足地面标定实验需求。

关键词: 星等 星光模拟器 弱光标定方法 地面标定

Design and performance analysis of standard starlight simulator

FENG Guang-jun^{1,2}; MA Zhen^{1,2}; LI Ying-cai¹

1.Xi'an Institute of Optics and Precision Mechanics, CAS, Xi'an 710119, China;
2.Graduate University of CAS, Beijing 100039, China

Abstract:

In order to calibrate and test the space object cameras and star trackers, a starlight simulator which can simulate the minimum objects at infinite distance and the light source with weak starlight illuminance is required. In this way, the space object camera and star sensor can be calibrated in the laboratory and the effect of atmospheric variation can be reduced. The starlight simulators are made of the integrating sphere uniform point source and collimator, which can adjust the dynamic range of the light energy with iris diaphragm, raise the simulation star magnitude, detect the illuminance of point sources accurately, and then solve the problem of calibration under the condition of weak light by precisely measuring all the factors which influence the-illuminance of the star magnitude. The performance and accurate of the starlight simulator are analyzed. It meets the requirement of calibration and test for the space object camera and star trackers in the laboratory.

Keywords: star magnitude starlight simulator method of weaklight calibration laboratory calibration

收稿日期 修回日期 网络版发布日期

DOI:

基金项目:

通讯作者: 冯广军(1981-), 男, 安徽天长人, 硕士研究生, 主要从事星模拟器及杂散光测试等方面的研究。

作者简介:

作者Email: feng520jj@126.com

参考文献:

[1] 周艳, 赵建科, 昌明, 等.星敏传感器光学系统弥散斑测试方法 [J].应用光学,2009,30(3):454-456.
ZHOU Yan, ZHAO Jian-ke, CHANG Ming, et al.Measurement of dispersed spot for star sensor optics [J].Journal of Applied Optic,2009, 30(3):454-456.(in Chinese with an English abstract)

[2] KOCH D G, BORUCKI W,DUNHAM E. CCD pho-tometry tests for a mission to detect Earth-size planets in the extended solar neighborhood [J].SPIE,2000,4013:508-519.

[3] 郭玉蛟.星模拟器概述 [J].控制工程,1986(5):42-49.
GUO Yu-jiao.The generation of star simulator [J].Control Engineering of China,1986(5):42-49. (in Chinese with an English abstract)

[4] 金伟其,胡威捷.辐射度光度与色度及其测量 [M].北京:北京理工大学出版社,2006.
JIN Wei-qi, HU Wei-jie. Radiometry photometry colorimetry and measurement [M].Beijing:Beijing

扩展功能

本文信息

- ▶ Supporting info
- ▶ PDF(1264KB)
- ▶ [HTML全文]
- ▶ 参考文献[PDF]
- ▶ 参考文献

服务与反馈

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ 引用本文
- ▶ Email Alert
- ▶ 文章反馈
- ▶ 浏览反馈信息

本文关键词相关文章

- ▶ 星等
- ▶ 星光模拟器
- ▶ 弱光标定方法
- ▶ 地面标定

本文作者相关文章

- ▶ 冯广军
- ▶ 马臻
- ▶ 李英才

PubMed

- ▶ Article by Feng, G. J.
- ▶ Article by Ma, Z.
- ▶ Article by Li, Y. C.

